White Paper Report

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ARTeFACT MOVEMENT THESAURUS : White Paper

ABSTRACT

The ARTeFACT Movement Thesaurus (AMT), developed at the University of Virginia, uses motion capture technologies to study movement patterns. In the current phase of the project, the Thesaurus includes the ability to identify movements derived from codified techniques: ballet, jazz, and modern dance; tai chi; and yoga. Prior to motion capture, an ontology was developed with steps defined and categorized. An eight-camera Vicon system captured individual movements and movement phrases typically seen in studio and on stage. Using Matlab, 3-D data of individual movements are quantified through mathematical interpretation of joint positions and angles. Custom software developed in the project can then examine a particular set of movement coordinates and identify the movement that was performed. Future goals are to add conceptual movement and enable automated systems to recognize movements on 2-D film.

1. ARGUMENT

The 20th century was a period of vast growth in dance, especially in Western cultures, with multiple genres being created and codified techniques being developed. Along with the explosion of new works (danced texts) came an upsurge of research into dance and its acceptance as a scholarly discipline. As dance scholars place themselves within the humanities (in its broadest sense), they have often turned to methodologies used by humanists and today it is common to see theorists such as Foucault, Derrida, Irigaray invoked in papers and presentations. However, research into movement, and movement-based arts, depends greatly on the ability to peruse documentation beyond static written texts and still images. Thus, as visual capture technologies have developed, the preferred means of recording and studying a dance work is film and/or video (i.e. visual data). As beneficial as access to film has been to the discipline, this method of preserving and accessing dance contains its own challenges. The current practice of viewing hours of film undermines researchers' abilities to (a) find movement-derived data (b) find that data quickly (c) find data accurately described and (d) reuse the data. Further, while there are standards for preserving video, there are no standards for providing access and any attempt at mining data from a moving image is fraught with difficulty. Therefore, a new model is required, one that exploits advances in computer software and hardware to automate data analysis and can enhance research and innovation into movement-based research in the humanities.

2. PROJECT PARTICIPANTS

Leadership and discipline expertise was provided by Dr. Susan L. Wiesner and Dr. Bradford Bennett. As a founding member of the ARTeFACT project, Dr. Wiesner brings her extensive background in dance, technology, linguistics, and information science to bear as her cross-disciplinary work strives to enable the preservation of movement generated data and access to that data through automated means (e.g. feature-based tagging). Having presented and published papers on the ARTeFACT project, Dr. Wiesner has led the project as she collaborated with dance colleagues, library IT professionals, and engineers in the capture and creation of movement. As a co-director of the AMT, Dr. Wiesner provides knowledge in dance, metadata and movement-based ontologies.

Dr. Bennett, Research Director of the Motion Analysis and Motor Performance (MAMP) Laboratory and Assistant Professor of Research in the Department of Orthopaedic Surgery at the Kluge Children's Rehabilitation Center located at the University of Virginia, is an expert in motion analysis, biomechanics, and motor performance. Dr. Bennett also has an appointment in the Department of Mechanical and Aerospace Engineering at UVA and the ARTeFACT project grew out of his first year design course and interactions with Dr. Wiesner as described below. Dr. Bennett has been an integral member of the project, providing expertise in engineering methods and motion capture technologies.

Rommie L. Stalnaker, the third principal project member, has worked on the ARTeFACT project since its inception. She brought her ability to analyze and verbalize movement in great detail as Research Assistant and movement specialist. So, too, did Ms. Stalnaker provide the movement (as physical object) and as such, provided the data derived from that movement. As a dancer, Ms. Stalnaker is uniquely positioned to provide the movement captured in the Vicon lab, as she has not only danced professionally in classical ballet, but also contemporary forms of dance, all of which she has taught at

Kennesaw State University and private studios. Very few dancers are able to cross over techniques at a high technical level, and using Ms. Stalnaker enabled us to maintain consistency in style and body type.

3. PROJECT HISTORY

ARTeFACT is a multi-layered, iterative project focusing on access to captured and preserved movement-driven data. Orignially conducted in the fall of 2007 at the University of Virginia Library in collaboration with an introductory course in Engineering and a student choreographer at Brenau University Women's College, several phases have been completed. The first phase included students in the engineering course (taught by Dr. Bradford Bennett) who developed devices that, when worn, would force the wearer to replicate a particular gait abnormality. The Brenau student choreographer, Rommie Stalnaker, then worked with the devices, the limitations of which inhibited her selection of a movement vocabulary thus causing her to abstract movement similar to those with physical disabilities. Under the direction of Jama Coartney, Head of the Digital Media Lab at UVa Libraries, Stalnaker's work (*For Natalie*) was preserved through still photographs, two static and mobile video cameras, and rudimentary motion capture devices (Nintendo wiimotes) which were placed on the dancers' bodies. Data signals from the wiimotes were captured using an interactive authoring program, Max MSP Jitter. Subsequent choreography (*Take 2*) by Susan Wiesner was based on the data from *For Natalie*, then captured and preserved using the same technologies. Ms. Coartney, Ms. Stalnaker, and Dr. Wiesner then conducted a comparative analysis of the data generated from the movement of two body parts of one dancer in both dance works. The choreographers' works were analysed against the data allowing us to see the mechanics of the movement and the visible traces of the movement patterns through the various artefacts. From this work, a preliminary metadata schema was developed, and tags were applied using ELAN (EUDICO Linguistic Annotator)[1] to a short video clip from *For Natalie*.[2]

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[1]ELAN is a video/audio annotation tool developed at the Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands. See http://www.lat-mpi.eu/tools/elan/ and or Brugman, H., Russel, A.

While working with the comparative analysis we determined that more advanced motion capture technologies were required, and returned to Dr. Bennett for assistance. During the motion capture process at the MAMP Lab (where we captured movement from *For Natalie* and *Take 2*), discussion turned to the production of a viable tool for automated feature-based tagging, what we called a movement thesaurus. Planning began between Drs. Bennett and Wiesner, Coartney, and Stalnaker for this next phase of the project.

4. STATE OF THE FIELD

Early forays into data mining and tagging to describe dance movement, such as the De-centering the Dancing Text Project at the University of Surrey (Deveril et al 2003). found the subjective aspect of movement description to be highly problematic. Therefore, the focus changed from dance to scripted film, facial expression, and gesture, all work that is ongoing at the University of Surrey and the University of Virginia, to name but two institutions. However, due to changes in technology and access to audio and video collections, interest in marking up dance texts is once again active. Although we are aware of no other project that will develop the visual thesaurus we envision, a few projects have had similar goals specific to dance research. One project, developed at MIT used ballet as a basis for recognizing human movement, but the movement set was much smaller, the movements selected for inclusion did not capture the breadth of step types, no ontology was developed, and the intent was not for a searchable database of codified movements (Campbell and Bobick 1994). Researchers at Arizona State University developed a multimodal gesture recognition engine for interactive performance using a VICON system in 2004; however, this system was not intended for data capture, preservation, and successive access, but was successful in interactive performance (Qian et al 2004). Also at Arizona State University, other researchers developed a small

(2004). Annotating Multimedia/ Multi-modal resources with ELAN. In: Proceedings of LREC 2004, Fourth International Conference on Language Resources and Evaluation.

[2]Coartney, Wiesner, and Stalnaker have presented their work at international conferences and Coartney and Wiesner published an article introducing the project in “Literary and Linguistic Computing” 2009.

information repository for dance using multimedia objects with the goal of enabling 'real-time analysis of multi-media dance data as well as techniques for indexing, search and retrieval of stored dance repositories' (Goldshani et al 2004) Although similar in conceptual approach, the point of this research is to record anthropologic data, not to use the data for automated retrieval of video. At the National Institute of Technology in Tamil Nadu, India, researchers are developing a system to annotate dance media through semantic tags, using both manual tagging and semi-automated authoring tools. This research considers the thematic content of the dance and allows for contextual metadata associated with an individual work; it does not suggest using motion capture to develop a thesaurus. Researchers at the Maryland Institute for Technology in the Humanities (MITH) have developed a tool for tagging the moving image - AXE - and continue to work with musical theatre and the performing arts as a basis for study. Interest in movement and video analysis extends beyond the dance and the humanities into fields involving biochemistry, sports, and kinesiology, as well as artificial intelligence, pattern recognition, animation, and robotics.

Tools such as ELAN provide the means for multimodal manual and qualitative annotation of time-based media and represent the current state-of-the-art. ELAN supports XML, unicode, and template creation, and provides mechanisms for controlled vocabularies and gesture identification and analysis of codified pedestrian movement. While labor intensive, these manual markup tools provide a first-step in documenting and understanding significant features of temporal texts (Lausberg, H. & Sloetjes, H. 2008) Google Lab's research project, GAudi (Google Audio Indexing), uses a speech recognition system to provide written transcriptions of speeches. While still in test phase, this tool demonstrates highly functional search and discovery capabilities; however, it still relies on written text as a basis of discovery (http://labs.google.com/gaudi/static/faq.html, date accessed: Mar 23, 2009). Recently, Dr. Bennett began collaborating with Dr. Scott Acton and the Virginia Image and Video Analysis (VIVA) group at the University of Virginia on the problem of gesture recognition (Basu et al 2010). This collaboration will allow us to move from 3-D data to 2-D film in future work. While examples of projects such as these are not specific to codified movement, extrapolating best practices and working principles across disciplines assists us in understanding the lexical demands and in designing tools that will allow for the searching of dance texts.

5. PROJECT GOALS AND OBJECTIVES

Throughout the life of the ARTeFACT project, goals have been developed specific to the various phases. For the development of the AMT, basic goals included: determining codified movement to capture from various forms of dance; creating the descriptive metadata schema for the movements; analyzing the dynamics for each movement (using Laban's theories of effort shape); capturing the data in the motion-capture lab; analyzing the data from the motion capture; tagging the accompanying video; developing rudimentary algorithms as 'tests'; and evaluating the preliminary test results against film. For the current phase of the project the goals included: developing an ontology for the movements (individual steps and phrases incorporating several steps); recording a large set of codified movements with digital video cameras; converting the video to marker/joint positions in 3-D; and creating software that can use the marker positions to identify the codified movements. All three project personnel have participated at some level in each task, although each took take the lead per their expertise at each step. In addition to the principal project members, students under the direction of Dr. Bennett in the MAMP Lab at the Kluge Children's Rehabilitation Center have assisted in the capture, processing, and mathematic representation of the data.

6. WORK PERFORMED

6.1Ontology

In the first phase of the project we developed an ontology which contains fields and variables pertinent to an individual STEP. STEPS are herein defined as specific codified movements performed in isolation or in combination with other Steps; these steps are most likely performed as part of technique class, and are subsequently used in choreographic works as sections of movement phrases. In the ontology, see Figure 1, a particular movement (a step) is given a STEP name whether or not it is an individual STEP or a combination of STEPS. Fields related to the body reflect the body itself (body parts, position, joint angles, etc., relating to the information collected about the body though the motion capture), the dynamics of the movement (in line with Laban's Effort/Shape analytics), and the location of the body in vertical space (levels). Other fields reflect the institutional nature of dance technique by noting genre and style. If a STEP is associated with a distinct style (or styles) within a particular genre that STEP is so labeled; labels are as follows:

- Ballet: Cecchetti (CCI), Vaganova/Russian (VR), French (FR)
- Modern: Cunningham (CNM), Humphrey/Limon (HL), Graham (GRM)
- Jazz: Giordano (GIO), Fosse (FOS), HipHop (HH)

The relation of a STEP to other STEPS is noted as physical and verbal manifestation. That is, if a STEP is related to another through a physical manifestation, we note that it is also an element of another STEP or STEPS. For example, a passe in ballet (where the foot comes to the knee) is included in a pirouette (a turn that begins with a passe, with the working foot staying in place at knee level). If there is a verbal equivalent to a step in another genre, that is also noted (i.e. an ecarte derriere in ballet basically equates to a tilt in modern dance); this is a movement synonym. At times, there are STEPS that non-dancers call by using words common in general language; therefore, we have allowed for this by including a field labeled 'other name'. So, too, we allow for additional information on the terminology; this includes whether the STEP name is codified or folksonomic. Although we have not addressed movement phrases to date (these contain several individual steps), the ontology allows for multiple steps, with reference to the individual STEPS. Each STEP entry is saved in an xml file. Figure 1 shows the possible variables per the descriptive fields in the ontology, and two examples of completed ontology entries are located in Appendix A.

STEP:						
-Level	High (eleve)	Mid (standing)	Low (plie and/or kneeling)	Flat (laying)	Air (jumps)	
-Body Part						
-Shape flow	Rising	Spreading	Advancing	Sinking	Enclosing	Retreating
-Effort	Space	Time	Flow	Weight		
-Spatial Orientation	Turning	Flat				
-Position	1st	2nd	4th	5th	6th	
-Hip Rotation	Turned out	Parallel	Turned in			
-Movement terms	Codified	Folksonomy				
-Genre	Ballet	Modern	Jazz	Tai chi		
-Style	VR, CCI, FR	CNM, HL, GRM	GIO, FOS, HH			
Element of	(movement is an element of other 'steps')					
Movement synonym	(Indicates steps in alternate genres)					
Other names	(Generally folksonomic terms used in same genre)					

Figure 1 Ontology Template for a single STEP

6.2 Motion capture

Although much of the work was completed remotely, the central location for gathering the data was the Motion Analysis and Motor Performance Laboratory at the Kluge Children's Rehabilitation Center and Research Institute. Here three dimensional motion data was captured using an eight camera Vicon 612 Motion Capture System (see Appendix B). After signing a consent form, approved by the University of Virginia IRB, anthropometric measurements were taken of the subject. Then a full body set of 38 spherical markers was applied to the dancer. Following a static trial for calibration three trials of each codified dance move were recorded.

For this project we asked the dancer to perform categorized, codified dance movements from different genres and styles of Western concert dance. In addition to dance movements, codified tai chi movements were also captured, and future plans are to add yoga postures and movements to the data. More than 130 distinct movements were captured. A complete list of the movements captured can be found in Appendix C. We processed this data which then generated files of joint paths through space, segment orientations to the global space, joint angles, and the angles between adjacent body segments relative to the body.

Figure 2 shows a still from the split screen video that is captured along with the marker positions during each trial. Figure 3 shows a simplified representation of the model constructed using the data collected and the dancer's anthropometrics.

Figure 2 A frame from the view of the split screen video captured along with marker positions.

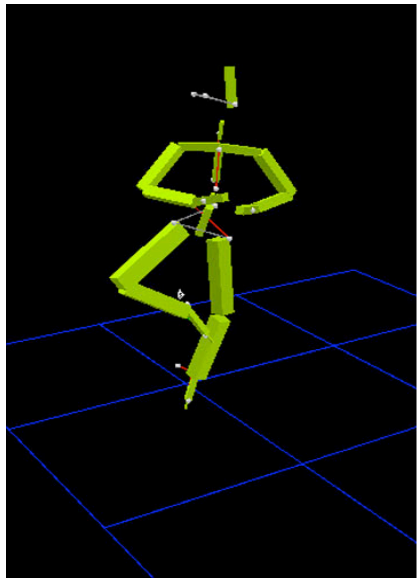

Figure 3 A model created from subject data and anthropometrics by the VICON system.

In addition to capturing movements, the Vicon software enables us to insert notes, comments, movement characteristics, and start/stop points. Figure 4 shows an example of a few STEPS, with the data for the pirouette (shown in Figures 2 and 3) highlighted. By inserting these verbal fields into the data file, we are able to distinguish at what point a STEP begins and ends; this is important when capturing codified movements, as many require 'preparation' which may or may not be performed. So, too, are the characterizations important in defining the movements and describing them with a higher level of granularity than the ontology.

	Start Point	Defining characteristic	End Point	Notes
chaine	foot 1 leaves ground	one full turn, with two foot contacts necessary to complete the turn	after 1 revolution foot 1 touches ground	typically multiple turns (2+)
pique turn	foot 1 leaves ground	working leg comes to a passe	after 1 rev foot 2 is at 1/4 pointe or flat	
pique en de hours	foot 1 leaves ground		after foot one completes revoluvtion as working leg in passe	lame duck
pique pas de bourree	coupe (see: sur le cou-de-pied)	can (not must) begin and end in coupe	2nd passe (must finish with a coupe)	2 movements, one travel **R** on **L**
pas de bourree en tourne	toe 1 lifts from back		foot 1 returns to flat or 1/4 pointe after one rev the en dedans is completed, en dehors starts here	both en dehors and en dedans in this file, Trial 3 was the best version
pirouette en dehors	torso descends/ knees bend	after rev completed, working foot can move into another position other than lunge. Body rotates away from standing leg	complete revolution, ideally working and standing leg stop together (working leg: in lunge (tombe), standing leg: foot flat with bent knee)	typically multiple turns (2+)
pirouette en dedans	torso descends/ knees bend	Body rotates towards standing leg	complete revolution, ideally working and standing leg stop together (working: comes out of passe (typically foot contact of some sort), standing to flat typically with bent knee)	typically multiple turns (2+)
attitude turn	foot 1 lifts from the back bent (usually 90ish)	some times working leg extends to arabesque after the revolutions	1.25 revolutions, standing leg flat, with knee bent	can have more than one turn (not typical)
fouette	working leg leaves passe and extends front	prep, leg goes passe, front swing side, passe done in one rev	one revolution	Preparation can be any sort of turn
italian fouette	working leg leaves passe and extends side to ecarte	prep, leg goes to ecarte, body turns/ switches 180, working leg brushes through 1st position, raises to attitude back	one revolution, ends in attitude	Preparation usually tendu front

Figure 4 Start/Stop Points captured with motion files

6.3 Data Analysis

As a marker-based study of body motion with predetermined feature points, the data analysis of motion capture includes feature identification (from which we can develop algorithms in future phases), the determination of post capture feature points, and the considerations of dynamic impacts (how the movement's effect and force on one area impacts other areas). Feature point considerations include Local (attached to body) and Global (location relative to space).

The data was processed using custom modeling software written in the VICON BodyBuilder language. This software has been fully validated (Bennett et al, 2005) and can generate marker and joint positions, joint angles, and body angles. This software generated an output file of joint positions which was read by a custom Matlab code, called idMOVE. While many parameters were available we designed idMOVE to use only the joint position data, as this was deemed to be most easily adapted to cases where only 2-D data was available. idMOVE, described in detail below, read the file of joint positions and identified what codified movement, STEP, was performed.

6.4 Movement Identification-Approach

The movement identification algorithm sits at the core of this project. While an efficient algorithm is desired, it must also have characteristics that allow it to be easily transferred to two-dimensional data that would be available from a typical dance film. We have avoided the use of joint angles, which can be problematic with a two dimensional view, and have focused on the use of vertical position of joints; both relative to the floor and to each other. While some three dimensional data has been employed in the current analysis, we believe its use can be eliminated without excessive burden on the computational algorithms or upon the accuracy of the algorithm.

The logic used to identify STEPS is a combination of logic to classify a dance move followed by comparing, i.e. correlating, certain movement characteristics with the known characteristics of individual dance moves. The logic used is illustrated in the flow chart of Figure 5. Thus, for complex moves, certain features of the move are measured from one trial and then compared/correlated to/with other trials. The idMOVE code is written in the Matlab language and reads in data from an ASCII file of joint positions.

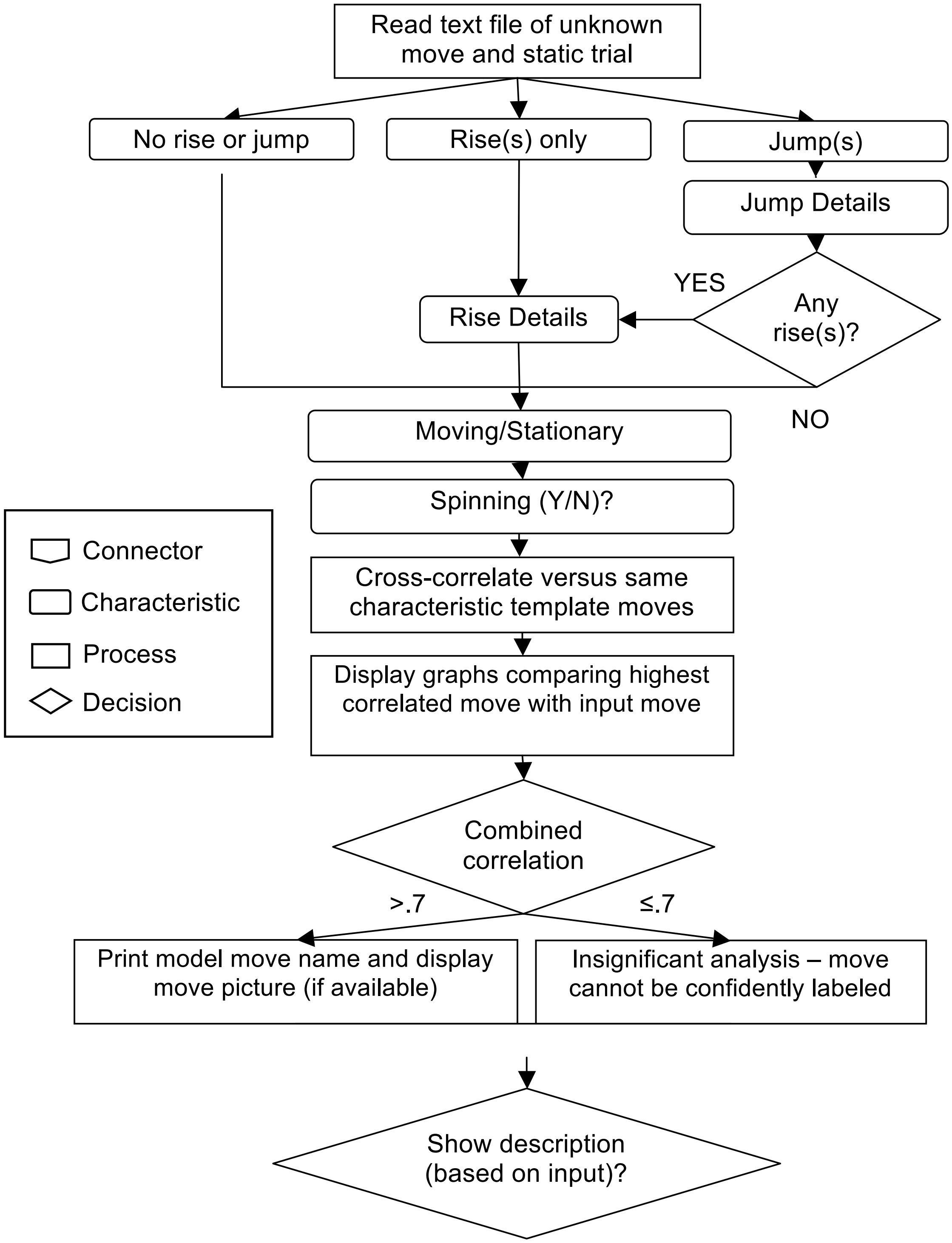

Figure 5. General flowchart for identification of dance moves applied in the idMOVE program.

7. NEXT STEPS

Since we began the AMT project additional phases of the project have started. The first of these is the study of conceptual movement rather than codified movement. This phase of research has at its core the ideas of George Lakoff and Mark Johnson (1981) regarding conceptual metaphor and requires the categorization of movements per terms as listed in the Collins Cobuild Dictionary of Metaphor. The first metaphor being studied is CONFLICT, through the lens of which we are studying seven dances purported to be about ‘war’ or some form of violence. From the data we can analyze either one body part or many in order to gather statistics regarding the choreographic use of movement patterns to depict the CONFLICT terms. In this way, we are using methods developed for literary analysis (in corpus linguistics) to study movement. This work is being funded by an ACL fellowship awarded to Susan Wiesner.

We also plan to further develop our ontology with the addition of the conceptual movements and long movement phrases, rather than individual steps. We hope to develop an automated means of populating a database containing ontology elements with a robust user interface. Finally, we plan to associate the ontology, as well as additional artefacts (written and graphic) held in the database, to the 3D data being collected.

Of course, work will continue on the movement from 3-D motion capture data to 2-D data and then to film without markers. The most challenging part of this will be interpreting joint location in film without markers. To facilitate this work we have begun collaborating with Dr. Scot Acton, Prof. Electrical and Computer Engineering at UVA and Director of the Virginia Image and Video Analysis research group (VIVA).

8. DISSEMINATION

We anticipate a broad spectrum of modes of communication and dissemination of the progress made during this phase of the ARTeFACT project. For example, project personnel are members of professional organizations in the library and archival fields, and in scholarly organizations in the dance, digital humanities, and engineering disciplines (e.g. ALA, ACRL, SAA, SDHS, ALLC, TLA, CORD, etc.). As such, all team personnel have attended conferences that have provided (and continue to provide) opportunities to discuss our work with colleagues and engender feedback on the project. Further, through professional networking, project personnel have disseminated information about various components of the project to interested parties (even writing an executive summary for upper-level administration at the University of Virginia). Interest in the project is gaining momentum not only at UVa, but also among dance scholars. We are preparing articles for publication in peer reviewed journals and proposals for presentation at digital humanities conferences. In addition, we are developing a website that will contain information on the history of the ARTeFACT project, participants in the project, a means of searching the AMT for images of codified movements, and links to other publications. The web site will also contain movement data collected in this project and software that will allow other researchers to explore uses of the thesaurus.

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Appendix A: Ontology Examples

STEP: Ecarte derriere						
-Level		High (eleve)	Mid (standing)			
-Body	*Part*	leg	torso	arms		
	Shape flow	rising	spreading	spreading		
	effort		time/ Sustained		weight/ Light	
-Position						
-Rotation		Turned out	Parallel			
-Movement terms		Codified				
-Genre		ballet	modern	jazz		
	style	VR, cci, FR	Cnm, HL,Wig	Gio, fos, hh		
Element of						
Movement synonym			tilt	tilt		
Other names		Leg Extension side				

This example ontology entry, STEP Ecarte Derriere, demonstrates the use of movement synonyms and other names (which often use general language vocabulary). The following ontology entry, STEP Fall Forward, shows the use of the 'element of' field**.**

STEP: Fall front						
-Level			Mid (standing)	Low (plie and/or kneeling)		
-Body	*Part*	torso	legs		arms	
	Shape flow	enclosing	spreading		spreading	
	Shape flow				enclosing	
	effort	space/Direct	time/Sustained	weight/Light	flow/Free	
-Position		1st				6th
-Rotation		Turned out	Parallel			
-Movement terms		Codified				
-Genre			modern			
	style		HL			
Element of	Recover front					
Movement synonym		Release swing	tembe	lunge		
Other names		Swing drop				

Appendix B: Vicon System Overview

The Motion Analysis and Motor Performance Laboratory of the University of Virginia includes a 1500 sq. ft motion. lab equipped with: VICON 8-camera 3-D motion analysis system, 2 in-ground Kistler force plates, 2 in-ground Bertec force plates, and a VIASYS Oxycon Mobile portable metabolic measurement system, 16-channel Motion Lab Systems, Inc. EMG system, Biodex isokinetic / isotonic dynamometer, 3 digital video cameras, 16 available channels of A/D data acquisition capacity. Other motion detection system: Ascension 6-degree-of-freedom Flock of Birds 6-D motion system, and an 8-channel radio-telemetered EMG system.

Laboratory staff: Full time staff includes a physical therapist and laboratory manager. Dr. Bradford Bennett, Asst. Prof. of Research, Research Director, oversees the day to day research operations of the laboratory and guides data collection and analysis. Dr. Mark Abel, Aflred Shands Professor and Chair of Orthopaedic Surgery serves as the Medical Director of the facility in cooperation with the Research Director. The laboratory has a reputation for and facilities to support collaborative research. Consequently, the laboratory is base for up to 6 graduate students at any one time from the Schools of Engineering, Sports Medicine, as well as the School of Medicine (medical students / residents).

Computers: The Motion Analysis and Motor Performance Laboratory contains a state-of-the art computer facility available for research. The computer room within the laboratory has 8 Intel Core2 microcomputers all networked together using Windows XP. The system has 150 gigabytes of memory, a tape back up, writable CD and DVD drives, CD and DVD readers, a laser printer, a color laser printer, and paper scanner. In addition, the offices of the Research Director., Medical Director, and each Co-PI have Pentium based PCs that are each networked to the computer facility. The laboratory also boasts of a Laptop computer that can be used to collect data and can be connected to laboratory computer facility through data outlets throughout the university. Multiple university mainframe computers can be accessed through the laboratory's computer facility.

Office: The Dr. *Bennett* has an office within the laboratory. Secretarial support is available for this office suite.

A full time laboratory manager is also employed by the Laboratory and is responsible for performing administrative functions such as purchasing, personnel appointments, travel, grant preparation and appointment scheduling.

Appendix C: List of Moves Captured

Positions:
1st Bras Bas
1st 1st
Ballet 2nd
Jazz 2nd
Modern 2nd
CCI 4th
4th French
5th
6th
Parallel 1st
Parallel 2nd
Parallel 4th

Movements:
- Plies (static)
1st Demi Plie
2nd Demi Plie
4th Demi Plie
5th Demi Plie
Parallel Demi Plie
1st Grande Plie
2nd Grand Plie
4th Grande Plie
5th Grande Plie

- Tendus (static)
1st Tendu Simple
5th Tendu Simple
1st Tendu Releve
5th Tendu Releve
1st Degage
5th Degage

Rond De Jambe:
En L'air
Grande L'air
A Terre

Positions of The Body:
- Cecchetti (CCI)
Croise
Devant/Derriere
A La Quatrieme Devant
Ecarte
Efface
A La Second
Epaule
A La Quatarieme Derriere
Croise Derriere

-Vaganova (VR)/French (FR)
Croise Devant
Croise Derriere
A La Quatrieme Devant
A La Quatrieme Derriere
A La Seconde
Ecarte Devant
Ecarte Derriere
Efface Devant
Efface Derriere
Epaule Devant
Epaule Derriere

Attitudes (mixed):
Attitude Efface (CCI)
Attitude Efface (VR)
Attitude Epaulee
Attitude Croisee Derrierre (CCI)
Attitude Croisee Derrier (VR)
Attitude Croise Devant

Legs/Feet:
Frappe
Fondu
Grande Battement

Full Body:
- Arabesque
Penchee
Arabesque
Isolations
Developpe En Avant
Developpe A La Seconde
Pitch
Tilt
Ecarte Derriere
A La Seconde
Cunningham Tilt

- other
Balancoir
Cloche
Cambre Front/Back

Traveling
Space Circle
Circle Back Walk
Pas De Bourree
Bourree
Ballet Run
Ballet Chug
Grapevine

-straightline/circular pattern
Jazz Side Pull
Jazz Walk
Jazz Square
Broadway Walk
Strut
Ballet Run
Jazz Run

Traveling (cont.)
Modern Walk (Pedestrian)
Prances

-Regular/Turning
Triplets
Modern Run
Horton Spring Points

Turns
Promenade En De Dans (3rd Arabesque En Plie)
Promenade En Dehors (1st Arabesque)
Over The Wall
Pencil Turn
Swerve Turn

Transitions
Tombe
Failli

Jumps
Stag Leap
Bison
Graham Jete
Saute Coupe
Pas De Chat
Glissade
Gargouillade
Assemble
Petite Jete
Grande Jete
Emboite
Sisson
Echappe
Changement
Entrechat Quatre
Soubresaut
Royale
Entrechat Six
Brise
Cabriole
Brise Vole
Jete
CCI-VR Pas De Chat
Failli Saute
Contretemp
Temps De Cuisse

Turning jumps
Emboite En Tourne
Chasse En Tourne
Tour Jete
Fouette
Tour
Saut De Basque
Assemble En Tourne
Barrel Roll

Turns en pointe
Pirouette En Dedans
Pirouette En Dehors
Chaine
Pique Turn
Fouette Turn
Pique Pas De Bourree
Pas De Bourree En Tourne
Attitude Turn
Pique En Dehors (Lame Duck)

Plie turns
Promenade En De Dans (3rd Arabesque En Plie)
Promenade En Dehors (1st Arabesque)

Descending
Hinge Floor
Hinge
Spiral
Jazz Slide Roll
Fall And Recover (Front Side Back)
Swedish Fall
Front Fall
Jazz Slide
Graham Fall Side

Combinations
Ballet combo A (Dbl Rond De Jamb En L'air Saute Pique Arabesque Failli)
Horton Achilles Stretch
Horton Plie Stretch
Horton Lateral Stretch
Horton Lunge Stretch
Ward-Off, Rollback, Press, Push
Elbow Stroke, Shoulder Stroke
Brush Knee, Play Guitar
Continuous Punch (Also Continuous Fist)
Grasp Birds Tail
Continuous Punch Old Style Is Cont Fist, Punch, Stab Hand, Kick, Reverse High Pat
Yin Yang Steps

Rep/Form
Sugar Plum Variation
Graham Variation 1
Graham Variation 2
Two Corner Short Form

Floor movements
Shoulder Roll
Shoulder Roll Split Leg
Swedish Shoulder Roll
Graham Fall (Side)
Humphrey Spiral
Spiral

Tai Chi STEPS
Pull Back
Dragon Dance
Diagonal Stretch
Fair Lady
Cloud Hands First Style
Stab Hand
Kick
Reverse High Apt On
Horse
Brush Knee
Play Guitar
Punch
Dragon Dance (One
Leg)
Snake Creeps Down
Fan Through The Back
Opening Of Tai Chi
Single Whip
Single Whip Old Style
Horse Stance
Universal Post
Pull Back
Dragon Dance
Diagonal Stretch
Fair Lady
Cloud Hands First Style
Stab Hand
Kick
Reverse High Apt On
Horse
Brush Knee
Play Guitar
Punch
Dragon Dance (One
Leg)
Snake Creeps Down
Fan Through The Back
Opening Of Tai Chi
Single Whip
Single Whip Old Style
Ward-Off, Rollback,
Press, Push
Elbow Stroke, Shoulder
Stroke
Brush Knee, Play
Guitar
Continuous Punch
(Also Continuous Fist)
Grasp Birds Tail
Continuous Punch Old
Style Is Cont Fist,
Punch, Stab Hand, Kick,
Reverse High Pat
Yin Yang turn with Pull
down